

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2321
Gaithersburg, Maryland 20899-2321

SRM Number: 2625a
MSDS Number: 2625a
SRM Name: Carbon Dioxide in Nitrogen

Date of Issue: 01 June 2004 (QA)

MSDS Coordinator: Carmen S. Davis
Phone: (301) 975-6776
ChemTrec: 1-800-424-9300

FAX: (301) 926-4751
E-mail: SRMMSDS@nist.gov

SECTION I. MATERIAL IDENTIFICATION

Material Name: Carbon Dioxide in Nitrogen

Description: This SRM mixture is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psi), which provides the user with 0.73 m³ (25.8 ft³) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-580 brass valve, which is the recommended outlet for this carbon dioxide mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Other Designations: **Carbon Dioxide** (carbonic acid gas; carbonic anhydride; carbon oxide) in **Nitrogen** (dinitrogen) **Gas Cylinder**

| Name | Chemical Formula | CAS Registry Number |
|----------------|------------------|---------------------|
| Carbon Dioxide | CO ₂ | 124-38-9 |
| Nitrogen | N ₂ | 7727-37-9 |

DOT Classification: Non flammable Gas, UN1956

SECTION II. HAZARDOUS INGREDIENTS

| Hazardous Components | Nominal Concentration | Exposure Limits and Toxicity Data |
|----------------------|-----------------------|--|
| Carbon Dioxide | 3.0 % | ACGIH TWA: 5 000 mg/kg or 9 000 mg/m ³ |
| | | OSHA TWA: 5 000 mg/kg or 9 000 mg/m ³ |
| | | Human, Inhalation: LC _{LO} : 9 mg/kg/5 min |
| | | Rat, Inhalation: TC _{LO} : 10 000 mg/kg/24 h/30 days |
| | | Rabbit, Inhalation: TC _{LO} : 27 000 mg/kg/24 h/30 days |
| Nitrogen | balance | simple asphyxiant |
| | | Rat, Inhalation: LC ₅₀ : 1 068 mg/m ³ /4 h |
| | | Mouse, Inhalation: LC _{LO} : 320 mg/kg |

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

| Carbon Dioxide | Nitrogen |
|--|---|
| Appearance and Odor: colorless, odorless gas | Appearance and Odor: colorless and odorless |
| Relative Molecular Mass: 44.01 | Relative Molecular Mass: 28.0134 |
| Density: 1.522 | Density: 1.2506 g/L |
| Vapor Density (air = 1): 1.5 | Vapor Density (air = 1): 0.967 |
| Vapor Pressure (@ 21°C): 43 700 mm Hg | Vapor Pressure (-196 °C): 760 mm Hg |
| Freezing Point (@ 4000 mm Hg): -57 °C | Freezing Point: -210 °C |
| Boiling Point: not available | Boiling Point: -196 °C |
| Viscosity: not applicable | Viscosity (@ 27 °C): 0.01787 cP |
| Water Solubility: soluble | Water Solubility: 1.6 % |
| Solvent Solubility: soluble in alcohol, acetone, hydrocarbons, and organic solvents | Solvent Solubility: soluble in liquid ammonia; slightly soluble in alcohol |

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this carbon dioxide/nitrogen **DO NOT** exist. The actual behavior of the mixture may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: Nonflammable

Autoignition Temperature: Not Applicable

Flammability Limits in Air (Volume %): **UPPER:** Not Applicable
LOWER: Not Applicable

Unusual Fire and Explosion Hazards: Cylinders may rupture under fire conditions. Nitrogen reacts with lithium, magnesium, neodymium at high temperatures. Mixtures of ozone and nitrogen may be explosive. Titanium is the only element that will burn in nitrogen.

Carbon dioxide is a negligible fire hazard. Dusts of metals suspended in carbon dioxide atmospheres are ignitable and explosive.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire.

Special Fire Procedures: Fire fighters should wear full protective clothing and self-contained breathing apparatus (SCBA) when this material is involved in a fire. Keep fire cylinders cool with water spray. If possible, stop the product flow.

SECTION V. REACTIVITY DATA

| | | | |
|-------------------|----------|---------------|-----------------|
| Stability: | X | Stable | Unstable |
|-------------------|----------|---------------|-----------------|

Conditions to Avoid: Protect cylinders from physical damage and sources of heat. **DO NOT** store the cylinder in poorly ventilated areas.

Incompatibility (Materials to Avoid): Nitrogen is incompatible with metals and oxidizing materials. Carbon dioxide is incompatible with combustible materials, oxidizing materials, metal salts, reducing agents, metal carbides, metals and bases.

See Section IV: "Fire and Explosion Hazard Data".

Hazardous Decomposition or Byproducts: Thermal decomposition of nitrogen will produce oxides of nitrogen. Thermal decomposition of carbon dioxide will produce oxides of carbon.

Hazardous Polymerization _____ **Will Occur** _____ **X** **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: _____ **X** **Inhalation** _____ **X** **Skin** _____ **Ingestion**

Nitrogen: This material is a high-pressure gas that can cause rapid suffocation. This gas may also cause eye, skin, and respiratory tract burns. The mixture can act as a simple asphyxiant by displacing air necessary for life. Nitrogen inhaled under increased atmospheric pressure, (>1.5 atmospheres), may dissolve in the fat-containing brain cells, and act as an anesthetic, causing necrosis. Persons who have been exposed to nitrogen under increased pressure and then suddenly released from the pressure may develop decompression sickness. Decompression is sickness caused by the formation of nitrogen bubbles in the blood following a rapid drop in pressure and is characterized by severe pains in the joints and chest, skin irritation, cramps, and paralysis.

Carbon Dioxide: Exposure to carbon dioxide, at concentrations of greater than 2 %, may cause acidic taste, dyspnea, headache, vertigo, nausea, labored breathing, weakness, drowsiness, mental confusion, and an increase in blood pressure, pulse, and respiratory rate. Exposure to higher concentrations may cause visual disturbances, tinnitus, tremors, profuse, and respiratory rate. Prolonged exposure can cause adverse metabolic production of calcium/phosphorus levels with serum levels of calcium and urinary phosphorus progressively falling.

Carbon dioxide in the liquid or solid form may cause frostbite with redness or pain.

Medical Conditions Generally Aggravated by Exposure: Nitrogen aggravates respiratory disorders.

Carbon dioxide aggravates heart or cardiovascular disorders and respiratory disorders.

Listed as a Carcinogen/Potential Carcinogen (Carbon Dioxide and Nitrogen):

| | Yes | No |
|--|-------|----------|
| In the National Toxicology Program (NTP) Report on Carcinogens | _____ | <u>X</u> |
| In the International Agency for Research on Cancer (IARC) Monographs | _____ | <u>X</u> |
| By the Occupational Safety and Health Administration (OSHA) | _____ | <u>X</u> |

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with copious amounts of water for at least 15 minutes while removing contaminated clothing. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance if necessary.

Inhalation: Immediately remove victim to fresh air. If breathing has stopped, give artificial respiration by qualified personnel. If breathing is difficult, give oxygen. Lay victim with head and chest lower than hips to improve drainage of fluids from the lungs. Obtain medical assistance.

Ingestion: Not Applicable (gas)

TARGET ORGAN(S) OF ATTACK: Not Available

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released: Evacuate and ventilate area. Remove leaking cylinder to exhaust hood or safe outdoor area. Shut off source if possible and remove source of heat. In the event of leakage, use SCBA.

Waste Disposal: Dispose of gas into an adequate amount of alkaline potassium permanganate solution. Dispose of non-refillable cylinders in accordance with federal, state, and local regulations. **DO NOT** return the empty cylinder to the supplier.

Handling and Storage: Secure cylinder when using to protect from falling. Use suitable hand truck to move cylinders. Wear safety shoes when handling cylinders. Use adequate general and local exhaust ventilation to maintain concentrations below exposure limits and to avoid asphyxiation. A chemical safety shower and an eyewash station must be readily available. For protection of eyes, wear safety glasses.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store in well ventilated areas away from combustibles. Keep valve protection cap on cylinders when not in use.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Source: MDL Information Systems, Inc., MSDS *Nitrogen*, 15 December 2003.
MDL Information Systems, Inc., MSDS *Carbon Dioxide*, 18 March 2004.

Disclaimer: Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references, however NIST does not certify the data on the MSDS. The certified values for this material are given only on the NIST Certificate of Analysis.